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Iraj Parchamazad

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EXAMINER

CANTELMO, GREGG

BRIGHT & LORIG

Ste. 3330

633 West Fifth Street

Los Angeles, CA 90071

ART UNIT

PAPER NUMBER

1745

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/693,220

Applicant(s)

PARCHAMAZAD, IRAJ

Examiner

Gregg Cantelmo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Priority

1. This application is a continuation-in-part of prior Application No. 10/281,584, filed October 28, 2002.

Information Disclosure Statement

2. No IDS appears to have been filed with the application prior to this office action.
3. Since this application is a continuation application filed under 37 CFR 1.53 (b), the examiner has considered information, which has been considered by the Office in the parent applications. Such information need not be resubmitted in the continuing application unless the applicant desires the information to be printed on the patent. In addition, copies of references cited in continuation applications if they had been previously cited in the parent application are not furnished (see MPEP § 707.05(a)).

Drawings

4. The drawings received October 24, 2003 are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: sheets 202 and 203 as recited on page 10, bottom paragraph. It would appear that 202 and 203 as recited there in should be 302 and 303. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
5. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because the handwritten reference characters of Figs. 9 and 10 are not

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explicitly clear. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

6. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the apparatus for storing pressurized hydrogen on the vehicle (claim 20) of the system for receiving hydrogen from external sources (claims 21, 22) of the system to deliver oxygen produced or stored on the vehicle to locations outside the vehicle (claim 23), of a system for delivering pressurized hydrogen produced or stored on the vehicle to storage systems outside the vehicle (claim 24), and the enclosed system of claim 33 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering

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of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

7. The disclosure is objected to because of the following informalities:
 - a. The status of the U.S. applications listed in the specification should be updated. For example, U.S. Application Serial No. 09/552,287, filed April 19, 2000, has since matured into U.S. patent No. 6,511,521 and U.S. Application Serial No. 10/281,584 has since been abandoned.
 - b. Reference character 501 is described as a "patio area 501 alongside a recreational vehicle 100". This area as shown in Fig. 8 appears to be some sort of vent area on the side of the recreational vehicle and not a patio area. Clarity is respectfully requested. Appropriate correction is required.

Claim Objections

8. Claim 17 is objected to because of the following informalities: the claim employs Markush-type language but does not conform to the manner of reciting a Markush group. In particular the alternative expression "or" recited at line 5 of claim 17 should be --and--. Alternative expressions are permitted if they present no uncertainty or ambiguity with respect to the question of scope or clarity of the claims. One acceptable form of alternative expression, which is commonly referred to as a Markush group,

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recites members as being "selected from the group consisting of A, B and C." See Ex parte Markush, 1925 C.D. 126 (Comm'r Pat. 1925). See MPEP § 2173.05 (h).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 33 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claim first recites that the fuel cell power system is mounted on the enclosure but then recites that the enclosure comprises a fuel cell therein. Thus the particular arrangement of the enclosure and fuel cell(s) assembly is not sufficiently specified. The figures and original description fail to adequately disclose what this claimed enclosure is attempting to claim and thus cannot be reasonably interpreted. Thus it would not be clear as to what the claimed arrangement encompasses, thus raising lack of enablement.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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10. Claims 1-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. The term "relatively pure hydrogen" in claims 1-17 is a relative term which renders the claim indefinite. The term "relatively pure" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is unclear as to what extent a hydrogen gas was appreciated as being "relatively pure" and the specification fails to provide any value or range of values which define that which the instant application appreciated as being "relatively pure" at the time the claimed invention was made.

b. Claim 5 recites the limitation "the air-water mixture" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. Claim 1 does not provide sufficient basis for this term and it is advised that the term be amended to -- an air-water mixture-- to overcome this particular rejection.

c. The term "balance of plant" is indefinite. It is vague as to what element(s) are defined and appreciated by the instant application as being "balance of plant."

d. The invention of claim 33 is not understood. The claim first recites that the fuel cell power system is mounted on the enclosure but then recites that the enclosure comprises a fuel cell therein. Thus the particular arrangement of the

enclosure and fuel cell(s) assembly is indefinite. The figures and original description fail to adequately disclose what this claimed enclosure is attempting to claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 1, 2, 4, 5, 15, 17, 20-22, 25, 27, 32 and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent Application Publication No. 2001/0028972 A (Autenrieth).

Autenrieth discloses a vehicle comprising a fuel cell power system mounted on the vehicle for providing power, heat and water to the vehicle, a hydrogen-powered fuel cell 10 mounted on the vehicle, a system 9/11 for delivering hydrogen to the fuel cell, a path from the fuel cell 10 for delivering electrical power to a load 16, a path from the fuel cell for delivering water to the vehicle (paragraph [0012]), and a path from the fuel cell for delivering heat to said vehicle (Fig. 1 as applied to claims 1 and 33).

Fuel processor 9 delivers hydrogen to the fuel cell and is mounted on the vehicle (Fig. 1 as applied to claim 2).

A heat exchanger 7 extracts heat from the exhaust lines (Fig. 1 as applied to claim 4).

Separator 15 is linked to the water outlet of the fuel cell 10 for extracting water from the fuel cell exhaust (Fig. 1 as applied to claim 5).

As best that the scope can be understood, the vehicle comprises fuel cell electronics such as the lines which provides electric power to the load 16 and battery 17 as well as a "balance of plant" the balance of plant being any additional elements to the system apart from those specifically recited in claim 1 such as a reformer, additional flow lines, etc. (Fig. 2 as applied to claim 15).

The fuel cell is a PEM fuel cell (paragraph [0003] as applied to claim 17).

The system 9/11, being in a vehicle inherently requires a tank for storing fuel (as applied to claim 20) and further includes a system for receiving fuel (as applied to claims 21 and 22).

The processor includes a reformer which is one of tubular, flat round, elliptical and rectangular in shape (as applied to claims 25 and 27).

The device is a vehicle and the vehicle can inherently be described as a recreation vehicle (as applied to claim 32).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth in view of U.S. patent No. 5,858,568 (Hsu).

The teachings of Autenrieth with respect to claim 1 have been discussed above and are incorporated herein.

The difference between claim 6 and Autenrieth is that Autenrieth does not explicitly disclose a reformer in the fuel processor.

Hsu teaches that when a hydrocarbon gas is provided as the fuel source, a reformer is typically employed to convert the hydrocarbon fuel to hydrogen to create the desired fuel composition for the fuel cell (Fig. 2).

The motivation for providing a reformer on-board of a vehicle having a fuel cell is that it provides a means for converting hydrocarbon fuels useful as fuel sources for a fuel cell into hydrogen gas prior to introducing the fuel to the fuel cell. One of ordinary skill in the art would have found such modification to be well known and obvious in the art for such purposes.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Autenrieth by providing a

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reformer on-board of a vehicle having a fuel cell since it would have provided a means for converting hydrocarbon fuels useful as fuel sources for a fuel cell into hydrogen gas prior to introducing the fuel to the fuel cell.

13. Claims 1-3, 6, 8, 10, 11, 15-17, 20-22, 25, 27 and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 6,107,691 (Gore) in view of U.S. patent No. 5,401,589 (Palmer).

Gore discloses a vehicle, including a recreational vehicle (paragraph bridging columns 3 and 4) comprising a hydrogen-powered fuel cell mounted on the vehicle (Fig. 7), a system for delivering fuel to the fuel cell (i.e. through reformer 112), a path from the fuel cell delivering electrical power to the vehicle (not shown in Fig. 7 but the vehicle of Fig. 7 is clearly labeled as a fuel cell powered vehicle in the same figure and thus inherently comprises a path for delivering power to the vehicle from the fuel cell), exhaust paths from the fuel cell which include heat and water products inherent to the fuel cell system (claim 1). The water is collected in water tank 196 of the vehicle and emergency drinking for off-road use (Figs. 14 and 20 as applied to claims 1 and 33).

A reformer (i.e. fuel processor) is present in the vehicle (Fig. 7) to deliver hydrogen to the fuel cell (as applied to claims 2 and 6).

An on-board fuel tank 181 is provided in the vehicle to provide fuel to the fuel cell. The intended use of the tank has no immediate bearing on the patentability of claim 8 since the material recited therein is not positively required by the claim nor does such material define the particular structure of the storage itself (as applied to claim 8).

This reasoning also applies to claim 10 which merely recites a storage facility *for* storing a fuel aboard said vehicle (as applied to claim 10).

The fuel processor or hydrogen generator is a reformer. Reforming a hydrocarbon to produce hydrogen is an inherent exothermic process and additionally generates rejected flammable gases as well as the hydrogen fuel gas (as applied to claim 11).

As best that the scope can be understood, the vehicle comprises fuel cell electronics such as the lines which provides electric power to the vehicle, the inverter and lines which provide power to the grid as well as a "balance of plant" the balance of plant being any additional elements to the system apart from those specifically recited in claim 1 such as a reformer (Figs. 7 and 9a as applied to claim 15).

An inverter is provided to change the electrical power along a path to a power-consuming means outside of the vehicle (Fig. 9a as applied to claim 16).

The Markush group of claim 17 encompasses all known fuel cell species and while Gore does not specify the fuel cell type the fuel cells is inherently one of the species of claim 17.

The vehicle comprises a system for receiving and storing fuel or hydrogen from external sources in a tank (not shown) (Fig. 3 as applied to claims 20- 22).

The fuel processor includes a reformer 112 (Fig. 7) which is of a desired shape which is inherently one of tubular, flat, round, elliptical and rectangular (as applied to claims 25 and 27).

The vehicle is a recreation vehicle (Fig. 3 as applied to claim 32).

The differences between claims 1 and 3 and Gore are that Gore does not explicitly teach of a path from the fuel cell delivering heat to the vehicle (claim 1) or of delivering the heat to areas alongside the vehicle (claim 3).

With respect to claim 1:

Gore clearly recognized that the waste products of a fuel cell could be advantageously used in other systems. The water produced is reclaimed and recycled as potable water in the vehicle (Fig. 20 for example). Other products from the operation use of a fuel cell which can be reused include heat generation (col. 14, ll. 36-41). Thus Gore sets for the groundwork for exploration and incorporation of recycling the products from the fuel cell including water (potable water) and heat.

It is well known in the art to use the heat generated from a fuel cell system for thermal management of other components wherein the fuel cell is provided. This is inclusive of vehicles having fuel cells therein.

Fig. 1 of Palmer discloses using reject heat from the fuel cell stack for either process or space heating.

The motivation for using the heat generated by the fuel cell is that it optimizes the use of the waste products of the system thereby improving the efficiency of the fuel cell system and further provides a means for heating other process steps in the system or space heating in the vehicle.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by delivering heat from the fuel cell to components of the vehicle since it would have optimized the use of the

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waste products of the system thereby improved the efficiency of the fuel cell system and further provided a means for heating other process steps in the system or space heating in the vehicle.

With respect to claim 3:

Again Gore teaches that the heat produced from the fuel cell system can be useful as a source of heat. For example in an event where heat cannot be obtained by widely commercial means such as oil heat and electric heat for heating a home, the heat generated by the fuel cell can be used as an alternative source of heat (col. 15, ll. 3-12).

It would have been obvious to one of ordinary skill in the art to deliver heated air from the fuel cell to areas external of the vehicle since it would have provided an alternative and low-cost source of heat.

14. Claims 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Palmer as applied to claim 1 above, and further in view of U.S. patent No. 5,985,474 (Chen).

Gore discloses providing a fuel processor as discussed above and incorporated herein.

The difference not yet discussed is the vehicle further comprising a heat exchanger that extracts heat from the processor and delivers the heat to the vehicle.

Chen discloses of providing a heat exchanger 24 adjacent to the reformer wherein heat from the reformer is extracted by the heat exchanger and the heat is then provided to the device which employs the fuel cell, by example of Fig. 1 to a building.

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Chen teaches that it is known in the art to extract heat from a reformer via a heat exchanger and then provide the heat to the larger system incorporating the fuel cell.

The motivation for providing the heat exchanger as taught by Chen is that it would have provided a means for recycling the heat produced by the reformer for use as a heat source for the device which utilizes the fuel cell. While the reformer is primarily used to generate hydrogen, using the remaining products of the reformer such as the heat generated by the exothermic process would have additionally increased the efficiency of the system.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by providing the heat exchanger as taught by Chen since it would have provided a means for recycling the heat produced by the reformer for use as a heat source for the device which utilizes the fuel cell. While the reformer is primarily used to generate hydrogen, using the remaining products of the reformer such as the heat generated by the exothermic process would have additionally increased the efficiency of the system.

15. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Palmer as applied to claim 1 above, and further in view of U.S. patent No. 5,470,673 (Tseung).

The difference not yet discussed is of the fuel cell being a direct-fuel fuel cell.

Tseung teaches that direct methanol fuel cells have particular value in transportation systems. For transport applications, the direct methanol fuel cell has a number of advantages over other fuel cell systems, notably immediate starting-up from

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cold; a fuel which is inexpensive, readily available and easily stored; safety in use; and the possibility of a hybrid fuel cell/internal combustion engine using a common fuel (col., 8, ll. 27-31).

The motivation for using a direct-fuel fuel cell is that it permits immediate starting-up from cold and provides an inexpensive fuel source which is readily available and easily stored.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by using a direct-fuel fuel cell as taught by Tseung since it would have permitted immediate starting-up from cold and provided an inexpensive fuel source which is readily available and easily stored.

16. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Palmer as applied to claims 1 and 11 above, and further in view of U.S. patent No. 5,612,012 (Soma).

As discussed above, the system of Gore has a hydrogen generator, which processes hydrogen from a hydrocarbon source (as applied to claim 13).

The difference not yet discussed is of the fuel processor comprising a hydrogen purifier (claims 12 and 13).

Soma teaches of providing a hydrogen purifier downstream of the reformer to decrease a ratio of the concentration of components other than hydrogen to the concentration of hydrogen so that the ratio may be lower than in the reformed gas (abstract).

The motivation for providing a hydrogen purifier downstream of the reformer is to decrease a ratio of the concentration of components other than hydrogen to the concentration of hydrogen so that the ratio may be lower than in the reformed gas.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by providing a hydrogen purifier downstream of the reformer as taught by Soma since it would have decreased a ratio of the concentration of components other than hydrogen to the concentration of hydrogen so that the ratio may be lower than in the reformed gas.

17. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Palmer and Soma as applied to claims 1 and 11-13 above, and further in view of WO 99/46032-A (WO '032).

As discussed above, the system of Gore has a hydrogen generator, which processes hydrogen from a hydrocarbon source (as applied to claim 13).

The difference not yet discussed is a gas accumulation reservoir receiving the rejected flammable gases from the hydrogen purifier and rejected hydrogen and other flammable gases from the fuel cell.

WO '032 discloses collecting waste products from the hydrogen purifier 214 and waste gases from the fuel cell and using these gases in a burner (page 20, ll. 16-34 and Fig. 5).

The motivation for collecting the waste gases and burning them as taught by WO '032 is that it generates heat for use in heating other components, gases and fluids in the fuel cell system.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by collecting the waste gases and burning them as taught by WO '032 since it would have generated heat for use in heating other components, gases and fluids in the fuel cell system.

18. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Palmer as applied to claim 1 above, and further in view of either DE 19838652 A1 (DE '652) or JP 64-063762 (JP '762).

The differences not yet discussed are a heat exchange system in connection with an absorption refrigeration system or absorption cooling system (claims 18 and 19).

DE '652 discloses a fuel cell system wherein a heat exchanger is provided to the fuel cell system to deliver heat to an absorption refrigeration unit (abstract).

JP '762 discloses a fuel cell system wherein a heat exchanger is provided to the fuel cell system to deliver heat to an absorption refrigeration unit (abstract).

The motivation for providing the fuel cell, heat exchanger and absorption refrigeration unit in a vehicle is that it improves the thermal management of the vehicle by recycling waste heat of the fuel cell as an operating medium for a vehicle refrigeration system.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by providing the fuel cell, heat exchanger and absorption refrigeration unit in a vehicle since it would have improved the thermal management of the vehicle by recycling waste heat of the fuel cell as an operating medium for a vehicle refrigeration system.

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19. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Palmer as applied to claim 1 above, and further in view of U.S. Patent No. 5,117,876 (Kuntz).

The differences not yet discussed are systems for delivering reactants which are produced or stored on said vehicle to locations or systems outside the vehicle (claims 23 and 24).

Kuntz discloses of a moving body which uses fuel cells to power the moving body wherein the system is provided with reactant drainage systems to remove unused reactant from the storage tanks in the fuel cell system (abstract and figures).

The motivation for providing reactant drainage systems to remove unused reactant from the storage tanks in the fuel cell system is that it permits servicing of the fuel cell system after purging of the reactants.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by providing reactant drainage systems to remove unused reactant from the storage tanks in the fuel cell system since it would have permitted servicing of the fuel cell system after purging of the reactants.

20. Claims 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Palmer as applied to claim 1 above, and further in view of either U.S. patent No. 6,352,792 (Parchamazad) or U.S. Patent No. 6,494,937 (Edlund).

The difference not yet discussed is of the processor comprising a hydrogen purifier of a particular geometric shape (claims 26 , 27 and 28), said purifier comprising

a support member and membrane sealed to the support member (claim 29) wherein the support member comprises perforated surfaces, porous materials or both (claim 30).

Parchamazad discloses using a hydrogen purifier of a particular geometric shape wherein the purifier comprises a support member and membrane sealed to the support member and wherein the support member comprises perforated surfaces, porous materials or both (Figs. 1 and 2).

Edlund discloses using a hydrogen purifier of a particular geometric shape wherein the purifier comprises a support member and membrane sealed to the support member and wherein the support member comprises perforated surfaces, porous materials or both (Fig. 2).

The motivation for employing the hydrogen purifier is that it removes CO and CO₂ contaminants from the hydrogen stream.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by using a hydrogen purifier since it would have removed CO and CO₂ contaminants from the hydrogen stream.

21. Claims 26-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gore in view of Palmer as applied to claim 1 above, and further in view of U.S. patent No. 6,299,994 (Towler).

The difference not yet discussed is of the processor comprising a hydrogen purifier of a particular geometric shape (claims 26 , 27 and 28), said purifier comprising a support member and membrane sealed to the support member (claim 29) wherein the

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support member comprises perforated surfaces, porous materials or both (claim 30) or wherein the purifier further comprises one of a pressure swing adsorption system, pressure swing temperature system, preferential oxidation system and chemical absorption system (claim 31)

Towler discloses using a hydrogen purifier of a particular geometric shape wherein the purifier comprises a support member and membrane sealed to the support member and wherein the support member comprises perforated surfaces, porous materials or both (Figures). The apparatus of Towler can be used in combination with hydrogen purification equipment such as pressure swing adsorption, temperature swing adsorption, absorption, cryogenic distillation, chemisorption, or membranes to provide high purity hydrogen for small commercial applications (paragraphs bridging columns 5 and 6).

The motivation for using pressure swing adsorption, temperature swing adsorption, absorption, cryogenic distillation, chemisorption, or membranes in a hydrogen purification system is to provide high purity hydrogen for small commercial applications.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gore by using a hydrogen purifier further comprising pressure swing adsorption, temperature swing adsorption, absorption, cryogenic distillation, chemisorption, or membranes in a hydrogen purification system since it would have provided high purity hydrogen for small commercial applications. The selection of a known material based on its suitability for

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its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

Conclusion

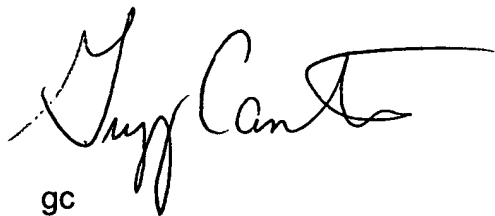
22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. JP 04-264366-A discloses a fuel cell exhaust heat recovery system. JP 63-230501-A discloses a method and system for recovering waste gases from a fuel cell system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is 571-272-1283. The examiner can normally be reached on Monday to Thursday, 8:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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gc

June 1, 2006

Gregg Cantelmo
Primary Examiner
Art Unit 1745